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zoid $PQHM$ is isosceles. $\therefore PM=QH$, but $PM=LB$. $\therefore LB=QH$ and is parallel to it since $\angle PLB=\angle PQH=\angle PEF$. $\therefore EF$ is parallel to QH .

Now E is the midpoint of PQ , hence O is the midpoint of PH .

Also solved by the Proposer.

304. Proposed by G. W. GREENWOOD, M. A., Dunbar, Pa.

Find the tangent at the points $(a, 0)$ and $(0, a)$ to the locus $x^3+y^3=a^3$, and show that these points are points of inflexion.

I. Solution by A. H. HOLMES, Brunswick, Maine.

$$x^3+y^3=a^3. \therefore \frac{dy}{dx} = -\frac{x^2}{(a^3-x^3)^{2/3}}, \text{ which is } 0 \text{ for } x=0, \text{ and } \infty \text{ for } x=a.$$

$$\frac{d^2y}{dx^2} = -\frac{2x(a^3-x^3)^{1/3}-2x^4}{a^3-x^3}, \text{ which is } 0 \text{ for } x=0, \text{ and } \infty \text{ for } x=a. \text{ Take } x>a,$$

and $\frac{d^2y}{dx^2}$ is seen to be minus. Take $x<a$ (a little) and $\frac{d^2y}{dx^2}$ is plus.

$\therefore (a, 0)$ and $(0, a)$ are points of inflexion.

II. Solution by BENJ. F. FINKEL, Ph. D., Drury College, Springfield, Mo.

We have for the slope of the curve at any point, $\frac{dy}{dx} = -\frac{x^2}{y^2}$. $\therefore y-y_1 = -\frac{x_1^2}{y_1^2}(x-x_1)$ is the equation of the tangent at any arbitrary point (x_1, y_1) of the curve. For $(0, a)$, the equation of the tangent is $y-a=0$. For $(a, 0)$, the equation of the tangent is $x-a=0$. From the equation of the tangent we have $y=y_1-\frac{x_1^2}{y_1^2}(x-x_1)$. In this equation, find y , for $x=x_1-h$ and $x=x_1+h$; also find the corresponding values of y from the equation of the curve, $y=\sqrt[3]{(a^3-x^3)}$. If the differences of these corresponding values of y change signs, the point is a point of inflection; if they do not, the point is an ordinary point of tangency. From the equation of the tangent, the values of y for the point $(0, a)$ are $y'=a$, $y''=a$, and from the curve $y'=\sqrt[3]{(a^3+h^3)}$, $y''=\sqrt[3]{(a^3-h^3)}$; $y'-y'=\sqrt[3]{(a^3+h^3)}-a>0$, $y'-y'=\sqrt[3]{(a^3-h^3)}-a<0$. Hence, $(0, a)$ is a point of inflection.

Similarly for the point $(a, 0)$, $y'=\infty$, $y''=-\infty$. $y'=\sqrt[3]{(3a^2h-3ah^2+h^3)}$, $y''=\sqrt[3]{(-3a^2h-3ah^2-h^3)}$, $y'-y'=\sqrt[3]{(3a^2h-3ah^2+h^3)}-\infty<0$, $y'-y'=\sqrt[3]{(-3a^2h-3ah^2-h^3)}+\infty>0$.

Hence, the point $(a, 0)$ is a point of inflection.

Also solved by G. B. M. Zerr, J. Scheffer, and the Proposer.